

# Digital Imaging Basics

# File Formats and Image Resolution

## Colour Depth

refers to how much information each pixel has, to describe colour. The more information (or greater colour depth) each pixel has, the greater range and accuracy of colours the resultant image will have and the more memory will be required to store it.

1 bit - black and white only

4 bit - 16 colours or tones of grey

8 bit - 256 colours or tones of grey (low end computer delivery)

16 bit - thousands of colours (equivalent to video)

24 bit - millions of colours (close to photographic quality)

## Colour Models

**RGB** - Red, green and blue are the primaries of light, also called additive colours. All colours can be produced by combinations of these. RGB colour space is used for computers and other projected light.

**CMYK** - Printed materials use cyan, magenta, yellow and black to make up colours. CMYK are the subtractive colours. CMYK has a lesser range, or gamut, than RGB. It's therefore best to work on digital images in RGB even if they are to be printed out. Converting a digital file from RGB to CMYK before going to print will change the colours of the file slightly and will make the file larger.

**Lab** - Luminance, A value (green to red), B value (blue to yellow). Lab can describe the greatest range of colour, more than can accurately be displayed on a computer monitor.

**HSB (or HSV)** - Hue, Saturation, Brightness (or Value). Hue refers to the colour by its position on the colour wheel; saturation describes how much of the hue is present, how strong or pure it is; brightness measures how light or dark it is.

**Pantone** - available through the custom button in the colour picker, pantone colours match standard printers inks. Their display on monitors is generally unreliable and it's best to have a Pantone booklet to refer to.

# Image size and resolution

The number of pixels that make up an image and the colour depth of those pixels determine the size of the image file and its resolution. The more pixels, the greater detail the image will have, the more megabytes it will take up and the more computing power will be needed to work on it.

The standard resolution for monitors is 72 pixels per inch (ppi). High resolution monitors can display at various resolutions; 96 ppi, 120 ppi etc

It's best to scan in images at a greater resolution than will be required, usually two times as much, then blur the file once and reduce the image size in Photoshop.

**Example:** for an image that will be eventually output as a 35mm negative

1. scan in a file that is approx 50 to 60 megabytes.
2. From the Filter Menu -> Blur the image.
3. From the Image menu -> Image Size. Reduce the file size to approx 32 megabytes.
4. Save the file as a Photoshop document.

## Optimal file sizes:

35mm film - 4096 x 2732 pixels -> 32.8mb

PAL video - 768 x 576 pixels -> 1.27 megabytes

14 inch computer monitor - 640 x 480 pixels -> 900 kilobytes

17 inch computer moonitor - 800 x 600 pixels -> 1.38 megabytes

If the file is to be printed, the resolution of the printer needs to be considered. A lower end desktop colour printer may have a maximum resolution of 150 dots per inch (dpi) and a maximum size of an A4 sheet of paper. High end printers may print at 1200 - 2400 dpi at various sizes.

20 x 29 cm at 150 DPI -> 5.79 megabytes

20 x 29 cm at 300 DPI -> 23.2 megabytes

It's important to know the final size (in megabytes) that will be required before scanning the source material, so that the scans will be the right size for the image you are making.

## File Formats

Photoshop can save files in many different file formats. TIFF and PNG are commonly used with imaging, digital video and graphics layout packages. JPEG and GIF are used for web work. The Photoshop format itself (PSD) is becoming more widely used by other applications (such as Flash, Director, InDesign, After Effects etc).

Most formats other than psd won't support Photoshop's layers feature and so the image will need to be *flattened*. Some formats will support one *alpha channel* or mask. Other *channels* will need to be discarded.

## Compression

will reduce the size in megabytes of the file when it is closed. It doesn't reduce the resolution or size of the file when open. It can damage the image and create unwanted artefacts. Compressing a file reduces the storage space needed. Compression is essential for images to be used on the web.

Work with uncompressed files wherever possible (ie; save it as a Photoshop file or a TIFF uncompressed).

Avoid recompressing an already compressed file (ie; don't open a JPEG file then *Save as* a JPEG again. Open the original Photoshop file and save it as a JPEG instead.).

### Compressing from Photoshop:

**Save for Web - GIF** offers colour depth reduction at the same time. GIF is an ideal format for images for the web if they consist of areas of flat colour.

**JPEG** compression was designed specifically for photographic images and offers a range of degree of compression. It is readable by various other programs and is ideal for photographic images for the web. JPEG damages the image in order to compress it.

**TIFF with LZW** compression does no damage to an image and is readable by many imaging and graphics layout packages. It compresses areas of flat colour very efficiently.

Other forms of compression are available and new ones are being developed constantly. Experiment with them - copy your file, compress it, close it, re-open it. Zoom in on areas of shadow and highlight detail in the compressed image to check for artefacts or damage.

# Accurate Selections

## Making Selections



The **Marquee** tools (top left dotted line rectangle or ellipse tool) can be dragged to make selections.

The **Lasso** tools (shown here) allow irregular shaped selections to be made.

**Lasso** - draw freeform

**Polygonal Lasso** - click from point to point around an area. Finish the selection either by double clicking or by clicking back on the starting point

**Magnetic Lasso** - draw freeform and the tool will attempt to snap onto any contrasty edges in the image.

**Magic Wand** - selects contiguous pixels similar in tone. The range of tones is determined by the *tolerance* setting in the options.

**Add to an existing selection** by holding the **shift** key and selecting the additional area

**Subtract from an existing selection** by holding the **option** key (**alt** on a PC) and selecting the area to be deselected.

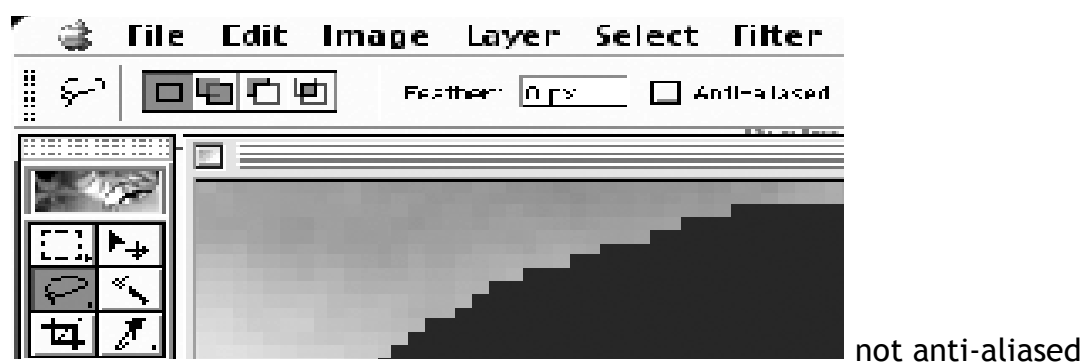
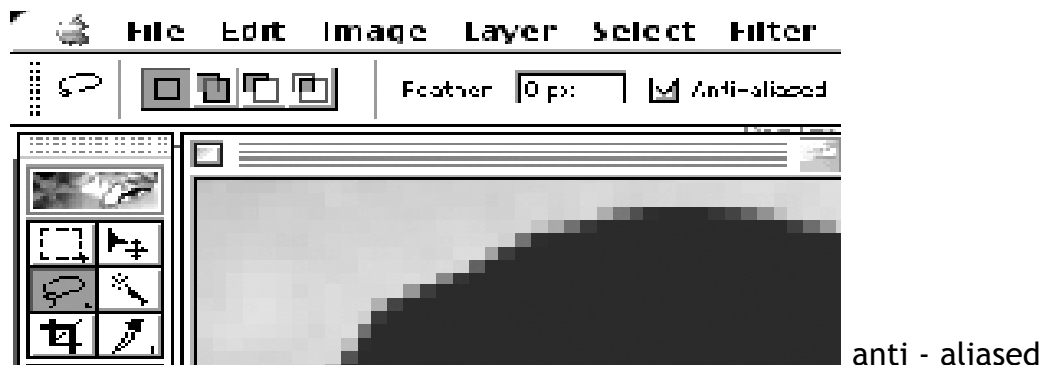
Zoom in to at least 100% when making selections to ensure accuracy.

## Tool Options

Most tools have options that can be set to modify the way they work. The options area is above the tool panel, below the main menu.

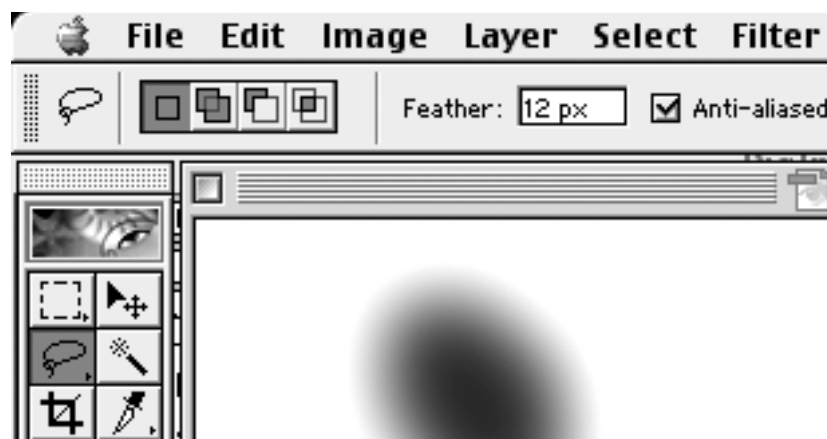
## Anti aliasing

is a slight blurring of edges in order to make edges appear smoother.



## Feathering

is a way of having a soft edged selection. The width of the blur will be equal to the number (of pixels) you type into the box.



## Options for magnetic lasso tool

Options for *width*, *edge contrast* and *frequency* can be set to alter the area to be checked, the sensitivity to contrast and how finely the process is done.



## The Select Menu

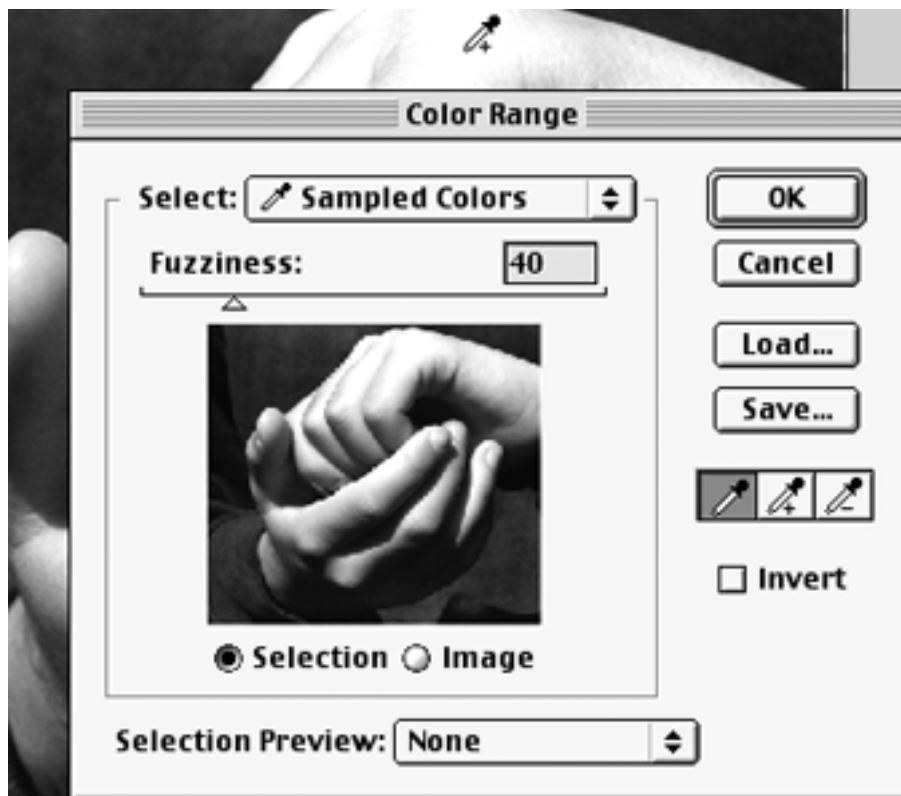
offers a range of options for modifying existing selections, for example; a jagged edged selection (such as those made with the magic wand tool) can be smoothed from Select -> Modify -> Smooth, or, feathering can be applied after making a selection from Select -> Feather.

**Grow** will increase an existing selection by picking up a wider range of tones.

**Similar** will pick up all pixels throughout the image of similar tone.

## Select Colour Range

selects a range of colours close to whichever colour is clicked on. The tolerance range is determined by the fuzziness slider. More colours can be added to the selection by using the eyedropper *plus* tool or removed from the selection with the eyedropper *minus* tool.

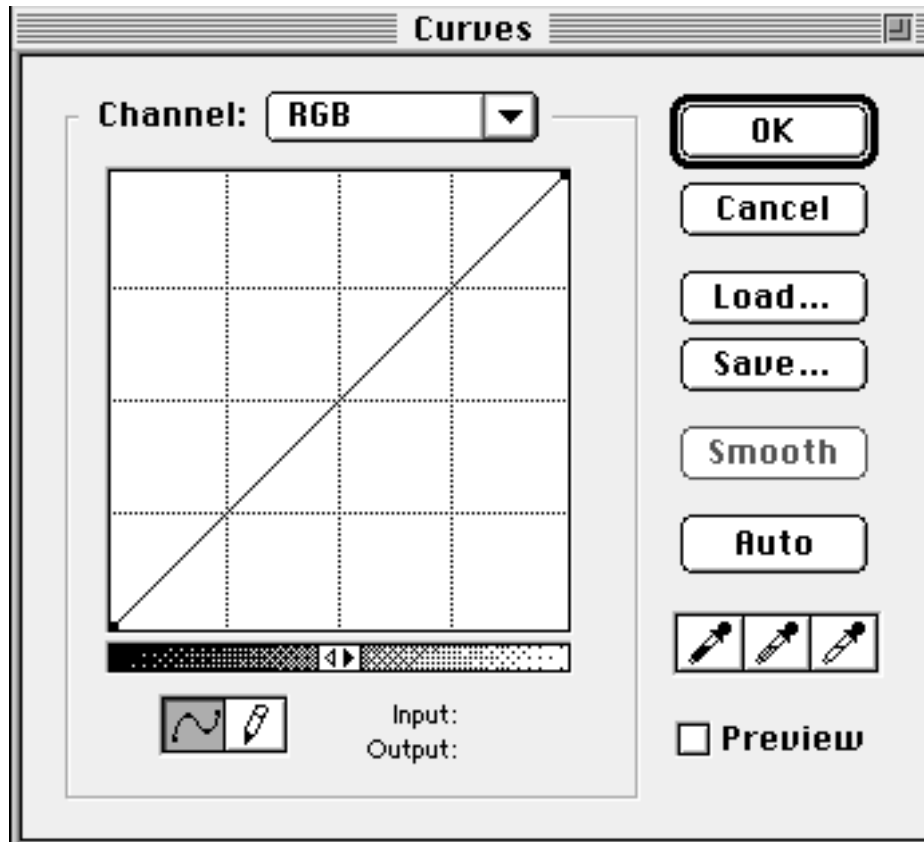


# Colour Manipulation

# Displaying Colour Information

## Curves

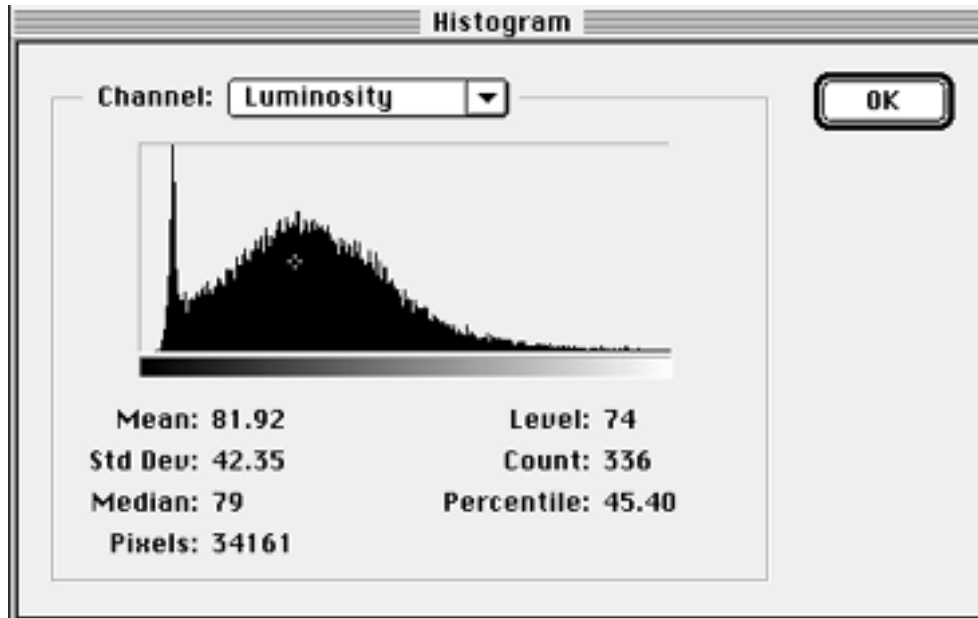
represent the brightness of pixels in the image, or selection, by a curve (first appearing as a diagonal line). 0 or black, is at the bottom left of the curve and 255, or white, is at the right.



Dragging the curve upwards will make the pixels of that corresponding tone brighter and dragging down will make them darker. For example, clicking on the middle of the curve and dragging upwards will make the midtones of the image lighter. Dragging the left of the curve to the top and the right to the bottom, reversing the direction of the diagonal line, will produce a negative image

## Histograms

display information about the pixels in the image, or selection, with a graph. The number of pixels that have a particular tone are represented by the height of the black graph. Black pixels (0) are at the left of the graph and white pixels (255) are at the right.



Histograms are useful for checking the tonal range of an image, particularly the details of highlights and shadows. If there are sections of the graph with gaps, then there are no pixels with those tones and will be no detail. A good range, for high quality film output, usually includes detail from 10 (very dark grey) to 240 (close to white). Video displays a more reduced range than this. Do test outputs to check.

The histogram dialogue box (as above) also gives information such as:

mean - the average brightness

std dev - how widely the tones vary

median - the middle tone

pixels - the total number of pixels in the image or selection

level - the tone of the selected single pixel

count - how many pixels have this tone

percentile - percentage of pixels below the selected single pixel's level

## Useful References

Various authors: "New Masters of Photoshop" Volumes 1 and 2, Friends of Ed

Also see their website for other titles - [www.friendsofed.com](http://www.friendsofed.com)

Davis, Jack: "The Photoshop Wow Book" Peachpit Press

Weinman, E & Lourekas, P: "Photoshop Visual Quickstart Guide", Peachpit Press

Weinman, Lynda: "Hands On Training for Photoshop", New Riders

Ben Willmore: "Adobe Photoshop Techniques" Adobe Press

## Websites:

[www.adobe.com/learnexplore.html](http://www.adobe.com/learnexplore.html)

[www.adobe.com/products/tips/photoshop.html](http://www.adobe.com/products/tips/photoshop.html)

[www.scantips.com](http://www.scantips.com)

[www.planetphotoshop.com](http://www.planetphotoshop.com)

[www.photoshopcafe.com](http://www.photoshopcafe.com)